534650-1-1-TM

DATATAPE®

12-454A FM RECORD AMPLIFIER

TECHNICAL MANUAL

BELL & HOWELL
DATATAPE DIVISION
300 SIERRA MADRE VILLA, PASADENA, CA 91109

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SECTION I

GENERAL DESCRIPTION

1-1. GENERAL.

1-2. This manual describes the Bell & Howell 12-454A FM Record Amplifier and its application as a component of a magnetic tape record/reproduce system.

1-3. In frequency modulation recording, the amplitude/time relationship of the data input signal is first converted to a frequency/time relationship and then recorded on magnetic tape. Its wider dynamic range capabilities result from the fact that a record of amplitude excursion is not restricted by the level at which magnetic saturation of the tape occurs. Side benefits of this principle are improved linearity and relative freedom from dropouts. Low frequency response extends to dc.

1-4. EQUIPMENT DESCRIPTION.

1-5. The 12-454A FM Record Amplifier illustrated in figure 1-1 is constructed on a printed circuit board similar to the other record and reproduce amplifiers used in this record/reproduce system. One circuit board is used per channel. Each circuit board plugs into a connector in the amplifier case assembly and is positioned by guide slots. Operating power is furnished when the circuit board is installed in the amplifier case assembly. The components are mounted on one side of a double sided printed circuit board. A shield, to minimize RF interference and coupling between amplifiers, is mounted on the back side of the circuit board. The dimensions of the FM record amplifier are 4-19/32 inches high by 7-3/8 inches deep by 29/32 inches wide.

1-6. The input signal is normally through a BNC connector on the front panel. The most commonly used controls and test points are also accessible from the front of the circuit board.

1-7. One circuit card is used for IRIG Extended Wide Band Group I, IRIG Wide Band Group I, IRIG Intermediate Band, and IRIG Low Band. The configuration desired is selected by placement of a jumper located on the circuit card.

1-8. PERFORMANCE CHARACTERISTICS.

1-9. Typical performance characteristics for the 12-454A FM Record Amplifier are given in table 1-1.

ITEM	CHARACTERISTIC
Input Level	0.5 to 10 V peak-to-peak adjustable for ±40% deviation.
Input Impedance	20K ohms minimum, single ended, shunted by 20 pico-farads maximum.
DC Linearity	±0.5% of full deviation from best straight line through zero.
Operating Temperature	0° to 50°C.
Output Signal	Adjustable from 0 mA to 70 mA peak-to-peak into a magnetic record head. The output waveform is symmetrical within 5% of the period at any fixed frequency.
Power	±15 Vdc, 50-60 mA; +5 Vdc, 50 mA.
Center Frequency and Bandwidth	IRIG Extended Wide Band Group I ±40% Deviation

Tape Speed (ips)	Center Frequency (kHz)	Bandwidth (kHz)
60	432	DC to 80
30	216	DC to 40
15	108	DC to 20
7-1/2	54	DC to 10
3-3/4	27	DC to 5
1-7/8	13.5	DC to 2.5
15/16	6.75	DC to 1.25

IRIG Wide Band Group I ±40% Deviation

Tape Speed (ips)	Center Frequency (kHz)	Bandwidth (kHz)
60	216	DC to 40
30	108	DC to 20
15	54	DC to 10
7-1/2	27	DC to 5
3-3/4	13.5	DC to 2.5
1-7/8	6.75	DC to 1.25
15/16	3.375	DC to 0.625
15/32	1.688	DC to 0.312

Table 1-1. Typical Performance Characteristics, 12-454A FM Record Amplifier (Sheet 1 of 2)

ITEM	CHARACTERISTIC

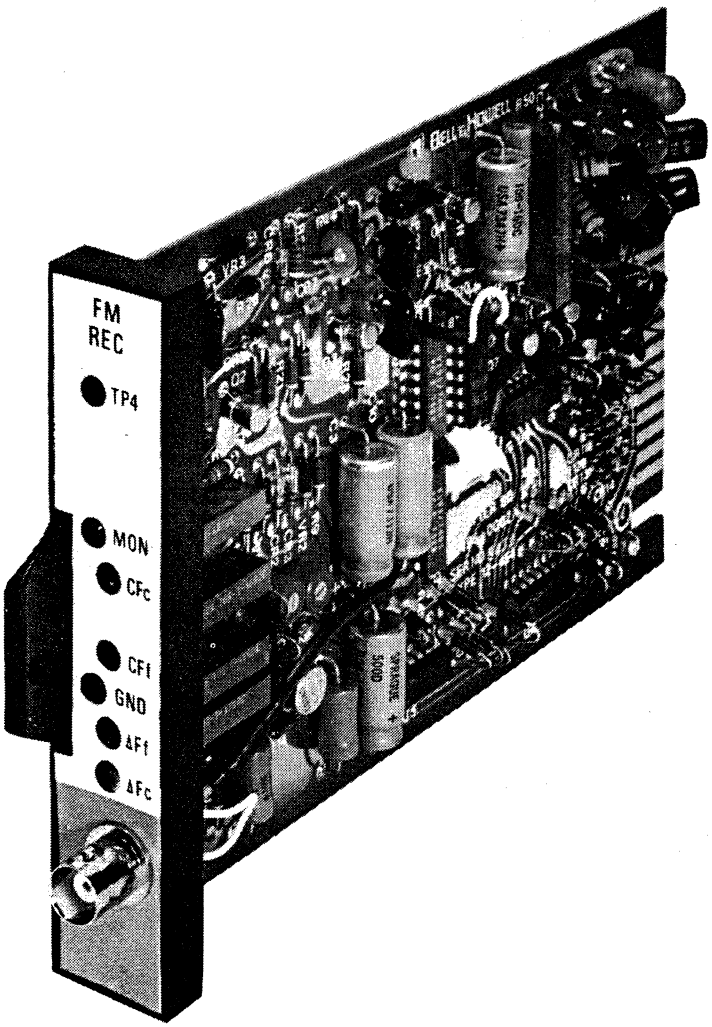
IRIG Intermediate Band ±40% Deviation

Tape Speed (ips)	Center Frequency (kHz)	Bandwidth (kHz)
60	108	DC to 20
30	54	DC to 10
15	27	DC to 5
7-1/2	13.5	DC to 2.5
3-3/4	6.75	DC to 1.25
1-7/8	3.375	DC to 0.625
15/16	1.688	DC to 0.312

IRIG Low Band ±40% Deviation

Tape Speed (ips)	Center Frequency (kHz)	Bandwidth (kHz)
60	54	DC to 10
30	27	DC to 5
15	13.5	DC to 2.5
7-1/2	6.75	DC to 1.25
3-3/4	3.375	DC to 0.625
1-7/8	1.688	DC to 0.312

Table 1-1. Typical Performance Characteristics, 12-454A FM Record Amplifier (Sheet 2 of 2)



3608-9 K.H.
TP116-2-B.H.

Figure 1-1. 12-454A FM Record Amplifier

SECTION II

INSTALLATION

2-1. GENERAL.

2-2. When the 4020 system is installed on an initial installation, the FM record amplifiers are installed as part of the installation procedure. Refer to Section II of the system manual for the installation procedures.

2-3. When removing or replacing an FM record amplifier, follow the installation procedures in Section II of the system manual. It will also be necessary to perform the calibration procedures described in the Calibration and Maintenance Section (Section V) of the system manual for the FM record/reproduce electronics.

2-4. Table 5-9 in the system manual gives the jumper tabulations for the 12-454A FM Record Amplifier for each bandwidth. Ensure that the FM record amplifier is properly jumpered for the operational requirements.

SECTION III

OPERATION

3-1. GENERAL.

3-2. The 12-454A FM Record Amplifier is fully operational when power is turned on. Refer to Section III of the system manual for the operational procedures for the FM record amplifier, as the FM record amplifier must be used in conjunction with an FM reproduce amplifier.

3-3. Ensure that the FM record amplifier is jumpered properly in accordance with table 5-9 in the system manual.

SECTION IV

THEORY OF OPERATION

4-1. GENERAL.

4-2. This section contains the theory of operation for the 12-454A FM Record Amplifier. The FM record amplifier consists of an input attenuator network, a dc amplifier, a voltage controlled oscillator (VCO), a differentiator, a frequency divider, and a record head driver. A block diagram of the FM record amplifier is shown in figure 4-1. A detailed schematic diagram is shown in figure 7-1.

4-3. CIRCUIT DESCRIPTION.

4-4. INPUT ATTENUATOR AND DC AMPLIFIER. The input data signal is applied to the dc amplifier through an attenuator network of resistors R1, R2, and R3. This network is used to adjust the percentage of deviation of the carrier center frequency.

4-5. The dc amplifier is a high input impedance differential amplifier with an inverting and a noninverting input. Negative feedback is established from the output of the amplifier at pin 6 through resistor R11 to the inverting input, pin 2. The gain of the amplifier is determined by the ratio of R11 to R10 and is approximately 16.

4-6. The output level of the dc amplifier is determined by adjustment of the network of resistors R5 and R6, the center frequency controls. Normally, the amplifier is adjusted for carrier center frequency out of the VCO with no signal input. However, if a dc level is present with the data signal and is not desired, it is possible to compensate for this by adjusting resistors R5 and R6 to obtain carrier center frequency out of the VCO.

4-7. VOLTAGE CONTROLLED OSCILLATOR (VCO). The VCO is an astable multivibrator consisting of transistors Q1, Q2, and Q3 and their associated components. To ensure positive starting of the multivibrator, the positive supply voltage is applied before the negative supply voltage. This is accomplished by Q2. When power is applied to the circuit, Q2 starts to conduct. This clamps the emitters of transistors Q1 and Q3 at ground potential until the positive supply voltage is at the proper level and the multivibrator begins to oscillate. Transistor Q2 has no other function in the circuit.

4-8. DIFFERENTIATOR AND FREQUENCY DIVIDER. The network consisting of capacitor C8, resistor R32, and transistor Q6 serves to differentiate the signal between the multivibrator of the VCO and the digital integrated circuits of the frequency divider. Transistor Q6 operates between ground potential and plus five volts. The dc potential difference is blocked at capacitor C8 which also serves as part of the differentiating network. Transistor Q6 is biased in the ON-condition by resistor R32, and therefore, positive-going edges of the input from the VCO have no effect on the circuit operation.

4-9. Between the differentiating network and the frequency dividers is a data stream switch consisting of U2 and 1/4 of U5. The operation of the data stream switch is controlled by the position of the HI/LO switch on the transport control

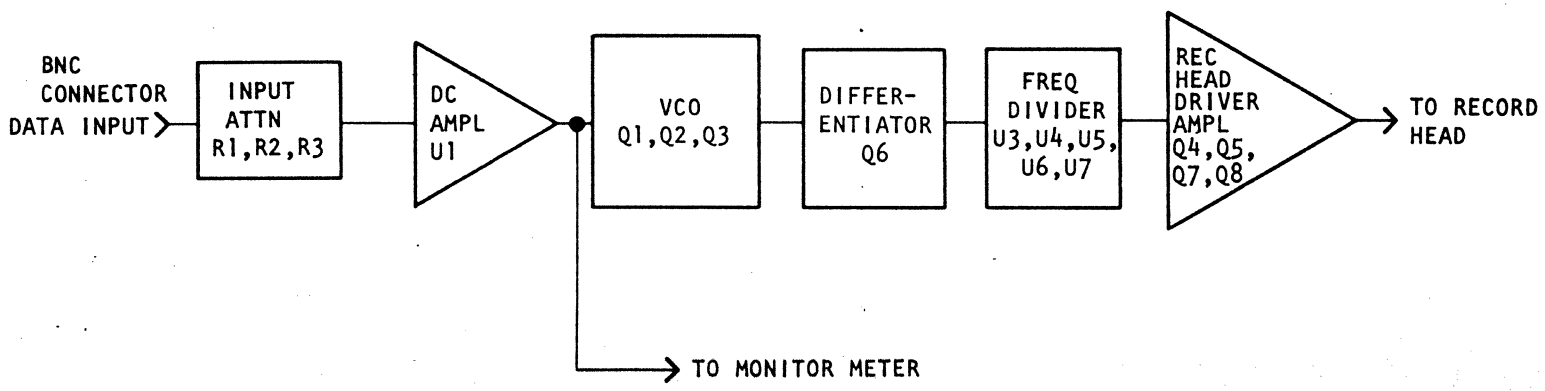


Figure 4-1. Block Diagram, 12-454A FM Record Amplifier

panel. When the HI/LO switch is in the HI position, the FM control line (pin B) will be a logical "1". This logical "1" enables U2-10 and disables U2-2, which allows the VCO output from transistor Q6 to be applied to pin 1 of U3. When the HI/LO switch is in the LO position, input pin B is at ground (logical "0") and U2-2 is enabled while U2-10 is disabled. With the HI/LO switch in this position, the VCO output from transistor Q6 will not be routed through the data stream switch as before, but will be applied to pin 14 of U3 where it will be divided by 2 and this output at pin 12 of U3 will be routed through the lower half of the data stream switch and applied to pin 1 of U3. For example, the VCO center frequency of 864 kHz will be applied to U3-1 when the HI/LO switch is in the HI position, whereas a frequency of 432 kHz will be applied to U3-1 when the HI/LO switch is in the LO position.

4-10. Integrated circuits U3 and U4 form the frequency divider. Each has an output terminal for divide-by-2, divide-by-4, divide-by-8, and divide-by-16. By patching from input terminal E11 of U3, to either E7, E8, E9, or E10, the entire range of carrier frequencies for each band and tape speed is made available. IRIG Extended Wide Band Group I is selected by patching E11 to E7, IRIG Wide Band Group I is selected by patching E11 to E8, IRIG Intermediate Band is selected by patching E11 to E9, and IRIG Low Band is selected by patching E11 to E10. The output of U3 or U4, which is to be used as the carrier frequency, is determined by the gates of U5, U6, and U7. The speed control lines from the transport enable one of these lines, dependent upon tape speed selected. A high signal on the speed control line which feeds each gate enables the output of that gate to follow the input from the counter U3 and U4. When a gate is not enabled, its output is high. Therefore, all inputs, except one, to gate U7 are always high. That one exception is the gate which has its speed line input enabled. As a result, the output of U7 will be the frequency selected by the speed control line.

4-11. RECORD HEAD DRIVER AMPLIFIER. The carrier signal is ac coupled from logic gate U7 to the record head driver amplifier. The record head driver amplifier is made up of two push-pull stages and is ac coupled to the record head. Head Current control, R37, determines the magnitude of the current sent to the record head and is adjusted according to the procedure given in Section V of the system manual.

SECTION V

CALIBRATION AND MAINTENANCE

5-1. GENERAL.

5-2. This section of the 12-454A FM Record Amplifier manual consists of preventive maintenance, and troubleshooting and corrective maintenance.

5-3. PREVENTIVE MAINTENANCE.

5-4. Preventive maintenance consists of general cleaning and periodic inspection. Accumulation of dust, dirt, grit, and/or grease on the circuit boards is harmful and should be guarded against by periodic inspection and cleaning. Every six months, inspect the units for signs of deterioration, loose connections, insecurity of mounting, and foreign matter. The period of cleaning depends on the particular operating environment and should be determined by inspection. As necessary, clean the circuit board with a soft brush, low air pressure or vacuum, or suitable solvent, being careful not to damage the printed circuitry.

5-5. TROUBLESHOOTING AND CORRECTIVE MAINTENANCE.

5-6. Before attempting repair of a unit suspected of malfunction, verify that the symptom is not caused by malfunction of associated equipment such as the power supply, the amplifier case assembly, intercabling errors, etc. This can be done by substituting a known good unit for the suspected unit, or making continuity checks from unit to unit. If such a check eliminates the associated equipment as a source of trouble, check the adjustments which are detailed in Section V of the system manual.

5-7. Once the existence of a defective unit has been established, check it for obviously damaged components, such as burned resistors, or incorrect seating of components. The next step is to verify the proper supply voltage is reaching the unit. If the supply voltage is correct, the faulty stage within the unit can be located by tracing signals from stage to stage.

5-8. When it has been determined that a circuit card is faulty, it is necessary to use an extender card for access to the components. It is possible to troubleshoot the record amplifier without moving tape by placing the RCD TEST switch on the monitor meter panel in the ON position.

5-9. When troubleshooting, refer to figure 7-1, the schematic diagram for the FM record amplifier. With no signal applied and the lowest tape speed selected, the center frequency may be checked by connecting a frequency counter to TP3 or TP4. The record head driver amplifier is between TP3 and TP4, therefore, it can be easily isolated by checking at both test points for center frequency. If the center frequency is normal at TP3, each of the tape speed logic circuits may be checked out by selecting each of the other tape speeds.

5-10. If the amplifier center frequency is normal at all tape speeds, connect a signal to the input BNC connector. The output of the dc amplifier may be observed by connecting an oscilloscope to TP2. The output signal should appear the same as the input.

5-11. Once the defective stage has been located, the defective component in that stage can be determined by reference to the circuit descriptions in Section IV and the schematic diagram in Section VII of this manual, and by making continuity, voltage, and/or resistance measurements about the suspected components.

5-12. REPAIR.

5-13. Repair of the unit should be attempted only by personnel experienced in printed wiring techniques. It is recommended that repair be limited to replacement of defective parts and adjustment of controls. When removing and replacing defective parts, care should be exercised so as not to damage contiguous parts of the circuit board itself. Replacement parts must be of the correct type and value, as listed in the parts list in Section VI of this manual. When installing a new part, place it in the exact position of the replaced part. After replacement, carefully inspect the circuit board for evidence of cold solder joints, solder splashes, and insecurity of mounting. If the equipment is repaired, the amplifiers should be checked and, if necessary, adjusted as described in the adjustment procedures contained in Section V of the system manual.

5-14. PARTS IDENTIFICATION.

5-15. Components of the 12-454A FM Record Amplifier are illustrated in Section VI of this manual, showing locations and part designations. The parts list in Section VI itemizes the component parts in the assembly and provides the Bell & Howell part number for each.

5-16. FIELD REPAIR SERVICE.

5-17. Refer to Section V of the system manual for field repair service information.

5-18. FACTORY REPAIR SERVICE.

5-19. Refer to Section V of the system manual for factory repair service information.

SECTION VI

PARTS LIST

6-1. GENERAL.

6-2. Appropriate parts lists and illustrations for the 12-454A FM Record Amplifier, Bell & Howell part number 534650-0001, covered by this manual follow the instructions given below. The parts list (table 6-1) includes Bell & Howell DATATAPE Division part number, description, figure and index and/or schematic reference symbol, and where applicable, the manufacturer's or military part number for each component.

6-3. MANUFACTURER'S CODES.

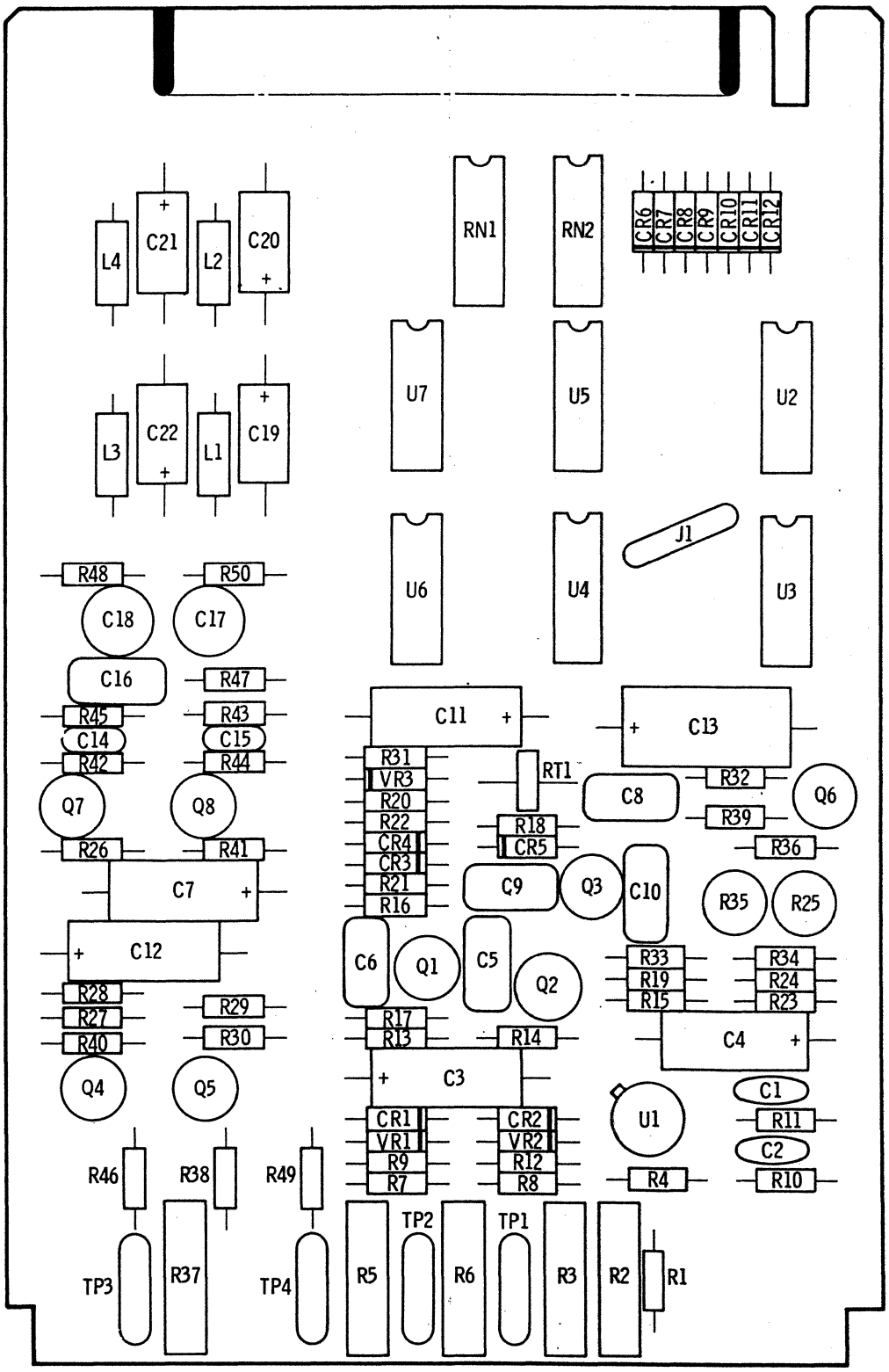
6-4. Manufacturer's code symbols used in the parts list are tabulated in the system manual with the manufacturer's name and address. All code symbols are in accordance with the Federal Supply Code for Manufacturers Handbooks H 4-1 and H 4-2.

6-5. ORDERING REPLACEMENT PARTS.

6-6. When ordering replacement parts refer to Section VI of the system manual for ordering instructions.

6-7. PARTS LOCATION ILLUSTRATIONS.

6-8. Figure 6-1 illustrates the location of components on the circuit card.



D-534652-A (REF)

Figure 6-1. Circuit Card Assembly

Table 6-1. Parts List for the FM Record Amplifier (Sheet 1 of 5)

ITEM NO.	B&H PART NO.	DESCRIPTION 0 1 2 3 4 5 6	QTY	FIG./INDEX OR REF SYM	MFR CODE	MFR OR MIL PART NO.
1	534650-0001	FM Record Amplifier	1		14028	
2	534652-0001	Amplifier, fm record	1	6-1	14028	
3	471922-2732	Res, fixed, metal oxide 27K ohm ±2%, 1/4 W	1	R28	24546	C4-27K OHM 2 PCT
4	471922-1002	Res, fixed, metal oxide 10 ohm ±2%, 1/4 W	1	R31	24546	C4-10 OHM 2 PCT
5	471922-1012	Res, fixed, metal oxide 100 ohm ±2%, 1/4 W	1	R50	24546	C4-100 OHM 2 PCT
6	471922-1022	Res, fixed, metal oxide 1K ohm ±2%, 1/4 W	6	R9,10, R12,23, R46,49	24546	C4-1K OHM 2 PCT
7	471922-1032	Res, fixed, metal oxide 10K ohm ±2%, 1/4 W	5	R4,13, R26,30, R32	24546	C4-10K OHM 2 PCT
8	471922-1132	Res, fixed, metal oxide 11K ohm ±2%, 1/4 W	1	R24	24546	C4-11K OHM 2 PCT
9	471922-1212	Res, fixed, metal oxide 120 ohm ±2%, 1/4 W	3	R20,44, R45	24546	C4-120 OHM 2 PCT
10	471922-1232	Res, fixed, metal oxide 12K ohm ±2%, 1/4 W	2	R34,36	24546	C4-12K OHM 2 PCT
11	471922-1322	Res, fixed, metal oxide 1.3K ohm ±2%, 1/4 W	1	R8	24546	C4-1300 OHM 2 PCT
12	471922-1522	Res, fixed, metal oxide 1.5K ohm ±2%, 1/4 W	1	R18	24546	C4-1500 OHM 2 PCT
13	471922-1532	Res, fixed, metal oxide 15K ohm ±2%, 1/4 W	2	R11,14	24546	C4-15K OHM 2 PCT
14	471922-1822	Res, fixed, metal oxide 1.8K ohm ±2%, 1/4 W	1	R7	24546	C4-1800 OHM 2 PCT

Table 6-1. Parts List for the FM Record Amplifier (Sheet 2 of 5)

ITEM NO.	B&H PART NO.	DESCRIPTION 0 1 2 3 4 5 6	QTY	FIG./INDEX OR REF SYM	MFR CODE	MFR OR MIL PART NO.
				6-1		
1	471922-2002	Res, fixed, metal oxide 20 ohm ±2%, 1/4 W	1	R17	24546	C4-20 OHM 2 PCT
2	471922-2222	Res, fixed, metal oxide 2.2K ohm ±2%, 1/4 W	1	R1	24546	C4-2200 OHM 2 PCT
3	471922-3012	Res, fixed, metal oxide 300 ohm ±2%, 1/4 W	2	R27,29	24546	C4-300 OHM 2 PCT
4	471922-3022	Res, fixed, metal oxide 3K ohm ±2%, 1/4 W	2	R16,21	24546	C4-3000 OHM 2 PCT
5	471922-4712	Res, fixed, metal oxide 470 ohm ±2%, 1/4 W	2	R19,47	24546	C4-470 OHM 2 PCT
6	471922-4732	Res, fixed, metal oxide 47K ohm ±2%, 1/4 W	1	R39	24546	C4-47K OHM 2 PCT
7	471922-6212	Res, fixed, metal oxide 620 ohm ±2%, 1/4 W	2	R40,41	24546	C4-620 OHM 2 PCT
8	471922-6802	Res, fixed, metal oxide 68 ohm ±2%, 1/4 W	1	R22	24546	C4-68 OHM 2 PCT
9	471922-7502	Res, fixed, metal oxide 75 ohm ±2%, 1/4 W	1	R48	24546	C4-75 OHM 2 PCT
10	471922-7522	Res, fixed, metal oxide 7.5K ohm ±2%, 1/4 W	2	R15,33	24546	C4-7.5K OHM 2 PCT
11	471922-9102	Res, fixed, metal oxide 91 ohm ±2%, 1/4 W	2	R42,43	24546	C4-91 OHM 2 PCT
12	7138-2725	Res, fixed, composition 2.7K ohm ±5%, 1/2 W	1	R38		RCR20G272JS
13	378770-0006	Res, var, metal oxide 500 ohm ±10%, 3/4 W	2	R3,6	80294	3009P-1-501
14	471677-0007	Res, var, metal oxide 1.0K ohm ±20%, 1/2 W	2	R25,35	80294	3329-P-1-102

Table 6-1. Parts List for the FM Record Amplifier (Sheet 3 of 5)

ITEM NO.	B&H PART NO.	DESCRIPTION 0 1 2 3 4 5 6	QTY	FIG./INDEX OR REF SYM	MFR CODE	MFR OR MIL PART NO.
				6-1		
1	378770-0008	Res, var, metal oxide 2K ohm ±10%, 3/4 W	1	R5	80294	3009P-1-202
2	378770-0011	Res, var, metal oxide 20K ohm ±10%, 3/4 W	2	R2,37	80294	3009P-1-203
3	70094-0005	Cap, fixed, mica 10 pF ±0.5 pF, 500 Vdc	1	C8	93790	CD15C100J03-500WV
4	70094-0027	Cap, fixed, mica 100 pF ±5%, 500 Vdc	2	C5,9	93790	CD15F101J03-500WV
5	70094-0029	Cap, fixed, mica 120 pF ±5%, 500 Vdc	2	C6,10	93790	CD15F121J03-500WV
6	70094-0047	Cap, fixed, mica 560 pF ±5%, 300 Vdc	1	C16	93790	CD15F561J03-300WV
7	471930-0018	Cap, fixed, electrolytic 10 uF -10 +75%, 16 V	4	C19,20, C21,22	14655	NLW 10-16
8	471930-0017	Cap, fixed, electrolytic 10 uF -10 +75%, 25 V	2	C7,12	14655	NLW 10-25
9	202790-0035	Cap, fixed, ceramic 50K pF +80 -20%, 25 Vdc	2	C1,2	72982	5855-Y5U503Z-25V
10	471920-0001	Cap, fixed, tantalum 68 uF ±20%, 15 Vdc	2	C17,18	05397	T362-C-686-M-015-AS
11	471930-0001	Cap, fixed, electrolytic 25.0 uF -10 +75%, 16 V	3	C3,4,11	14655	NLW 25-16
12	471930-0003	Cap, fixed, electrolytic 100 uF -10 +75%, 16 V	1	C13	14655	NLW 100-16
13	479699-0031	Cap, ceramic 3.3K pF ±10%, 100 Vdc	2	C14,15	72982	CK05BX332K
14	246954	Diode, signal switching 25 V work volt 1N4154	7	CR6 thru CR12	03508	1N4154

Table 6-1. Parts List for the FM Record Amplifier (Sheet 4 of 5)

ITEM NO.	B&H PART NO.	DESCRIPTION 0 1 2 3 4 5 6	QTY	FIG./INDEX OR REF SYM	MFR CODE	MFR OR MIL PART NO.
				6-1		
1	521520-0112	Diode 1N4376	5	CR1 thru CR5	14028	JAN1N4376
2	205933-0001	Diode, zener, 1N821 6.2 V ±5%	3	VR1,2,3	04713	1N821
3	379647	Integrated Circuit 2605 operational amplifier	1	U1	27410	HA2-2605
4	475693	Integrated Circuit 74L00	2	U5,6	01295	SN74L00N
5	525685-0001	Integrated Circuit type 74LS00	1	U2	01295	SN74LS00N OR J
6	525685-0004	Integrated Circuit type 74LS30	1	U7	01295	SN74LS30N OR J
7	471952	Integrated Circuit 7493 4-bit binary counter	1	U3	01295	SN7493AN
8	536040	Integrated Circuit type 74LS393	1	U4	01295	SN74LS393N
9	523655-2222	Component Network, dual-in-line, 2.2K ohm +250 -300%	1	RN1	73138	899-3-R-2.2K
10	523655-4722	Component Network, dual-in-line, 4.7K ohm +250 -300%	1	RN2	73138	899-3-R-4.7K
11	471472	Transistor, NPN 2N3947	1	Q8	04713	2N3947
12	532438	Transistor, NPN, silicon type 2N2369A	4	Q1,3,5,6	04713	2N2369A
13	471931	Transistor, PNP 2N3251	2	Q2,7	04713	2N3251
14	536194	Transistor, PNP type 2N4209	1	Q4	07263	2N4209

Table 6-1. Parts List for the FM Record Amplifier (Sheet 5 of 5)

ITEM NO.	B&H PART NO.	DESCRIPTION 0 1 2 3 4 5 6	QTY	FIG./INDEX OR REF SYM	MFR CODE	MFR OR MIL PART NO.
				6-1		
1	471788-0025	Inductor, fixed 150 uH ±5%	2	L1,3	99800	1537-84
2	800571-0049	Reactor 1.0 mH	2	L2,4	24759	MCR-1000.0
3	214537-0001	Thermistor	1	RT1	15801	CB21L1
4	204749-1002	Jack, tip, horizontal, pc red	1	TP2	83330	430-102
5	204749-1003	Jack, tip, horizontal, pc black	1	TP1	83330	430-103
6	204749-1006	Jack, tip, horizontal, pc orange	1	TP4	83330	430-106
7	204749-1007	Jack, tip, horizontal, pc yellow	1	TP3	83330	430-107
8	535630-0003	Plug, tip, shorting blue	1	J1	71279	461-3771-01-03-16
9	525300-0005	Jack, uninsulated printed circuit	5	E7 thru E11	71279	450-3704-01-03
10	379495	Plate, elect shield	1		14028	
11	379494-0005	Panel, front, ampl module	1		14028	
12	379380-0009	Label, front panel fm rec	1		14028	
13	479639	Plate, connector mount	1		14028	
14	7127-0002	Terminal, lug, solder screw size 3/8	1		71002	4
15	126732-0031	Connector, coaxial panel, receptacle	1	J1	91836	KC-79-46

SECTION VII

SCHEMATICS

7-1. GENERAL.

7-2. This section contains the schematic diagram (figure 7-1) for the 12-454A FM Record Amplifier.

IC TABULATION					
IC TYPE NO	SCHEMATIC DESIGNATIONS	GND PIN	VCC PIN	PIN NO'S OF SECTIONS NOT USED	REMARKS
2605	U1			1,5&8	
74L00	U5†6	7	14		
74L500	U2	7	14		
74LS30	U7	7	14	9,10,12&13	
7493	U3	10	5	4,2,7&13	
74LS393	U4	7	14	6,7&14	

LAST COMPONENTS DESIGNATED

R50, C22, CR12, VR3, Q8, L4, U7, E11, J1, RN2, TP1, TP4

4 ALL VARIABLE RESISTORS ARE IN OHMS ± 10%, 1W.
3 ALL DIODES ARE JAN IN4376.
2 ALL CAPACITORS ARE IN MICROFARADS/VOLTAGE DC.
1 ALL RESISTORS ARE IN OHMS ± 2%, ¼ W.

NOTES: UNLESS OTHERWISE SPECIFIED

E-534651-X3 (REF)

Figure 7-1. Schematic, 12-454A FM Record Amplifier